HPC PROJECT

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Base Line Application Execution Time:

```
arshaq@YogaX1:~/src/src$ make run
./nn.exe
MNIST Neural Network

Epoch 1 - Loss: 0.2670 - Train Accuracy: 91.88% - Time: 11.480s
Epoch 2 - Loss: 0.1044 - Train Accuracy: 96.86% - Time: 11.010s
Epoch 3 - Loss: 0.0729 - Train Accuracy: 97.86% - Time: 11.510s
Total training time: 34.000s
Test Accuracy: 96.93%
```

Gprof:

```
Each sample counts as 0.01 seconds.
  %   cumulative   self              self     total
 time   seconds   seconds    calls   s/call   s/call  name
 64.68     22.16    22.16   190000     0.00     0.00  forward
 34.18     33.87    11.71   180000     0.00     0.00  backward
  0.67     34.10     0.23        2     0.12     0.12  loadMNISTImages
  0.38     34.23     0.13                               main
  0.09     34.26     0.03        1     0.03    32.73  train
  0.00     34.26     0.00        2     0.00     0.00  loadMNISTLabels
  0.00     34.26     0.00        1     0.00     0.00  createNetwork
  0.00     34.26     0.00        1     0.00     1.17  evaluate
  0.00     34.26     0.00        1     0.00     0.00  freeNetwork
```

Call Graph generated by Gprof:

```
index % time    self  children    called     name
                                                   <spontaneous>
[1]     100.0    0.13   34.13                 main [1]
                 0.03   32.70     1/1             train [2]
                 0.00    1.17     1/1             evaluate [5]
                 0.23    0.00     2/2             loadMNISTImages [6]
                 0.00    0.00     2/2             loadMNISTLabels [7]
                 0.00    0.00     1/1             createNetwork [8]
                 0.00    0.00     1/1             freeNetwork [9]
-----------------------------------------------------------
                 0.03   32.70     1/1             main [1]
[2]      95.5    0.03   32.70       1         train [2]
                20.99    0.00 180000/190000       forward [3]
                11.71    0.00 180000/180000       backward [4]
-----------------------------------------------------------
                 1.17    0.00   10000/190000      evaluate [5]
                20.99    0.00  180000/190000      train [2]
[3]      64.7   22.16    0.00  190000        forward [3]
-----------------------------------------------------------
                11.71    0.00 180000/180000       train [2]
[4]      34.2   11.71    0.00  180000        backward [4]
-----------------------------------------------------------
                 0.00    1.17     1/1             main [1]
[5]       3.4    0.00    1.17       1         evaluate [5]
                 1.17    0.00   10000/190000      forward [3]
-----------------------------------------------------------
                 0.23    0.00     2/2             main [1]
[6]       0.7    0.23    0.00       2         loadMNISTImages [6]
-----------------------------------------------------------
                 0.00    0.00     2/2             main [1]
[7]       0.0    0.00    0.00       2         loadMNISTLabels [7]
-----------------------------------------------------------
                 0.00    0.00     1/1             main [1]
[8]       0.0    0.00    0.00       1         createNetwork [8]
-----------------------------------------------------------
                 0.00    0.00     1/1             main [1]
[9]       0.0    0.00    0.00       1         freeNetwork [9]
```